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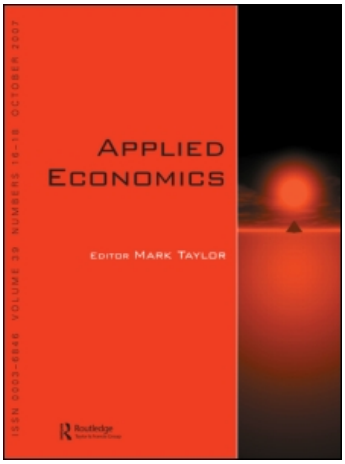

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The determinants and labour market effects of lifelong learning

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Despite the policy importance of lifelong learning, there is very little hard evidence from the UK on (a) *who* undertakes lifelong learning and *why*, and (b) the *economic benefits* of lifelong learning. This paper uses a rich longitudinal panel data set to look at key factors that determine whether someone undertakes lifelong learning and then models the effect of the different qualifications acquired via lifelong learning on individuals' economic outcomes, namely wages and the likelihood of being employed. Those who left school with O-level qualifications or above were much more likely to undertake lifelong learning. Undertaking one episode of lifelong learning also increased the probability of undertaking more lifelong learning. We found little evidence of positive wage effects from lifelong learning. However, males who left school with only low-level qualifications do earn substantially more if they undertake a degree via lifelong learning. We also found important positive employment effects from lifelong learning.

I. INTRODUCTION

During the last two decades, increasing emphasis has been placed by policy-makers, employers and individuals alike, on the positive role of human capital in promoting economic prosperity and social inclusion. There is a presumption that continual skill formation, one aspect of lifelong learning, has become highly important for those who are already in the labour market, in order to meet the ever-expanding skill needs of employers. Yet despite the policy importance of lifelong learning, there is still a lack of hard evidence from the UK on (a) *who* undertakes lifelong learning and *why*, and (b) the *economic benefits* of lifelong learning. This paper attempts to address this. Specifically it identifies key factors that determine whether someone undertakes lifelong learning, defined very narrowly for the purposes of this research as learning between the ages of 33 and 42 that results in a qualification. It then models the effect of the different qualifications acquired via lifelong learning on individuals' economic outcomes, namely wages and the likelihood of being employed.

To the best of our knowledge, this research is unique in at least two respects. Firstly, unlike most of the limited UK research on the impact of lifelong learning, we do not focus only on mature graduates.[1] Instead we assess both the extent and impact of lifelong learning leading to the *full range* of qualifications. Secondly, we use a rich longitudinal panel data set. This enables us to control for a huge array of factors that may influence whether someone undertakes lifelong learning. This is crucial if (as discussed at length below) we are to avoid endogeneity bias. We restrict our analysis to the labour market benefits of lifelong learning, namely employment and wage effects. However, our analysis suggests that individuals may undertake lifelong learning for a variety of reasons unrelated to the labour market. Future work on this issue should there-

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[1] See for example Egerton (2000, 2001a, 2001b)

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fore also focus on the non-economic benefits of adult learning.

Learning leads to learning. We found that those who left school with O level qualifications or above were much more likely to undertake lifelong learning. Undertaking one episode of lifelong learning also increased the probability of the individual undertaking more lifelong learning. We also found some evidence that for the least qualified individuals, in particular those with no qualifications or just CSEs in 1991, lifelong learning can pay off. In particular, males who left school with only low-level qualifications who acquired degrees via lifelong learning earned significantly more in 2000 than those who did not do any lifelong learning. In general however, we found limited evidence of positive wage effects from lifelong learning. We did find important positive employment effects from lifelong learning. Those who were out of the labour market in 1991 were more likely to be in work in 2000 if they had undertaken lifelong learning, in particular occupational and vocationally related learning, in the intervening period.

II. EXISTING LITERATURE

The extent of lifelong learning

Definitions of lifelong learning vary and thus so do estimates of the extent of participation in lifelong learning. For the UK, the National Institute of Adult Continuing Education (NIACE's) 1996 survey, using a relatively broad definition, found that 23% of adults were in current learning and a further 17% had done some learning in the previous three years (Sargant *et al.*, 1997; Sargant, 2000). Their 2001 survey (Aldridge and Tuckett, 2001) found that current learning had increased to 29%. The National Adult Learning Survey (NALS) used an even broader definition and found that in 1997, 68% of 16 to 69 year olds had taken part in some kind of learning activity, and 62% had done some vocational learning in the previous three years (Beinart and Smith, 1998). The Labour Force Survey (LFS) definition is narrower, including adults who were either enrolled for part-time study at educational institutions, or undertaking part-time correspondence courses, or who had been involved in vocational training in the last four weeks (Hillage *et al.*, 2000, p. 46). On this definition, at the end of 1998, about 13% of all adults were doing lifelong learning (Hillage *et al.*, 2000, p. 47). The International Adult Literacy Survey (IALS) in 1994/5 suggested that 45% of UK adults were participants in education and training. An analysis of these data (O'Connell, 1999) also provides a basis for international comparisons. At 45%, the UK's participation rate in adult learning compares well with the mean for all countries in the study of 36%.

Given the diversity of estimates of the extent of lifelong learning, perhaps a better question is whether the trend in participation is up or down. The NIACE surveys suggest roughly constant participation in the 1990s, with a marked increase in 2001. Data from the LFS suggest a rise in participation of around 2 percentage points, although Green (1999) indicates that the average length of a training episode fell over this period. There is some evidence that participation in adult learning has been growing elsewhere, both in North America and in other European countries (Field, 2000).

The benefits of lifelong learning

Given that such a large proportion of the population are or have been involved in lifelong learning, what evidence is there of economic benefits from lifelong learning? Although there are hundreds of studies that evaluate the economic returns to years of schooling, the literature on the economic benefits that *adult* learners derive from education and training is very sparse. In the UK, much of the existing literature focuses on mature graduates (e.g. Steel and Sausman, 1997). The main conclusion from this research is that rates of return for mature graduates are lower than for early graduates (Blundell *et al.*, 1997; Egerton and Parry, 2001; Steel and Sausman, 1997). The returns for mature graduates are lower partly because they have higher foregone earnings than 18–21 year-olds and less time in the labour market post-graduation. Blundell *et al.* (1997) used data from the National Child Development Study (NCDS) and found that men who began their course over age 21 earned a return about seven percentage points lower, while starting late did not appear to have any detrimental effect on women's earnings.[2] Since the cohort were only 33 at the time of the study, it is not possible to say whether these effects would persist over the rest of their working lives, nor do we know the consequences of getting a higher education qualification much later in life as opposed to just a few years late.

In summary, the literature is quite sparse and what there is relates generally to mature graduates. For this group the returns obtained are a good deal lower than for early graduates. The most striking feature of the existing literature is the lack of any information at all on the returns to non-graduate adult learning.

III. DATA

The data used in this paper come from the National Child Development Study (NCDS). The NCDS is a continuing

[2] These estimates do not allow for earnings foregone whilst acquiring a degree and thus are not true rate of return calculations.

longitudinal survey of people living in Great Britain who were born between 3 and 9 March 1958. Members of the NCDS cohort have been interviewed six times, the last full survey having been undertaken in 2000. A description of the samples obtained from each of these surveys is given in Table 1.[3]

Table 1. *Description of the National Child Development Study (NCDS)*

Sweep	Date of Survey	Age of Respondents	Sample Size
Perinatal	1958	0	17,414
I	1965	7	15,468
II	1969	11	15,503
III	1974	16	14,761
IV	1981	23	12,537
V	1991	33	11,407
VI	2000	42	11,419

The main advantage of using NCDS data is the richness of the information held about each cohort member, which includes their early attainment (scores on tests taken in reading and mathematics in childhood), school and family background variables. We focus on changes in individuals' academic and vocational qualifications that occurred between the 1991 sweep of the NCDS (age 33) and the 2000 survey (age 42). Hence our definition of lifelong learning is largely determined by the nature of the NCDS data and is based on whether an individual acquired a qualification between 1991 and 2000. We coded the qualifications using the official National Qualifications Framework, which distinguishes three types, each with five levels. The categories are shown in Table 2.[4] Although this framework produces a large number of different categories, it has the advantage of more precisely identifying the type of qualification acquired. Table 3 reports the numbers obtaining qualifications within each category. Relatively small numbers of individuals took each specific category

Table 2. *National Qualifications framework*

Level of Qualification	General (Academic)	Vocationally-related (Applied)	Occupational (Vocational)
5	Higher Degree		NVQ level 5 PGCE Professional degree level qualifications
4	Degree HE Diploma	BTEC Higher Certificate/Diploma HNC/HND	NVQ level 4 Nursing/paramedic Other teacher training qualification City & Guilds Part 4/Career Ext/Full Tech RSA Higher Diploma
3	A level AS levels Scottish Highers Scottish Cert of 6th Year Studies	Advanced GNVQ BTEC National Diploma ONC/OND	NVQ level 3 City & Guilds Part 3/Final/Advanced Craft RSA Advanced Diploma Pitmans level 3
2	GCSE grade A*–C O levels grade A–C O levels grade D–E CSE grade 1 Scottish standard grades 1–3 Scottish lower or ordinary grades	Intermediate GNVQ BTEC First Certificate BTEC First Diploma	NVQ level 2 Apprenticeships City & Guilds Part 2/Craft/Intermediate City & Guilds Part 1/Other RSA First Diploma Pitmans level 2
1	GCSE grade D–G CSEs grades 2–5 Scottish standard grades 4–5 Other Scottish school qualification	Foundation GNVQ Other GNVQ	NVQ level 1 Other NVQ Units towards NVQ RSA Cert/Other Pitmans level 1 Other vocational qualifications HGV

[3] Attrition from the NCDS (up to sweep 5) and the possible bias that may result are discussed in Ferri (1993). For our participation analysis we maximise our sample, only excluding those with missing values on the explanatory variables. For our wage analysis we drop from our sample those with missing observations on wages in 2000, and for the first difference equations those with missing values on wages in 1991 and 2000.

[4] This coding is based on the National Qualifications Framework developed by the Department for Education and Skills and the Qualifications and Curriculum Authority. Qualifications not formally assigned to the Framework were aligned with their nearest equivalent. Advice on how best to do this was received from individuals in the DfES, the QCA and City & Guilds, and is gratefully acknowledged.

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Table 3. *Incidence of Lifelong Learning in NCDS*
Numbers obtaining Qualifications between ages of 33 and 42 by National Qualifications Framework levels

	Number	Percent
Academic Level 1	23	0.23%
Academic Level 2	214	2.18%
Academic Level 3	108	1.10%
Academic Level 4	360	3.66%
Academic Level 5	130	1.32%
Vocationally-related Level 1	16	0.16%
Vocationally-related Level 2	156	1.59%
Vocationally-related Level 3	104	1.06%
Vocationally-related Level 4	98	1.00%
Occupational Level 1	1541	15.68%
Occupational Level 2	702	7.14%
Occupational Level 3	276	2.81%
Occupational Level 4	402	4.09%
Occupational Level 5	273	2.78%
Total Sample*	9829	100%

Note: *Note that individuals may acquire more than one qualification during this period.

of qualification but around one third of the cohort[5] acquired a qualification of some description during the 1991–2000 period.

Most certified lifelong learning led to occupational qualifications. 16% of the sample obtained occupational qualifications at level one. These include NVQ level one, lower level RSA qualifications and other low level qualifications such as Pitmans level one and HGV licences. Relatively small numbers took academic qualifications, the exception being the approximately 200 respondents (4% of the sample) who obtained a degree. Even fewer cohort members obtained vocationally related qualifications, such as BTEC diplomas and GNVQs. Other descriptive statistics are given in the appendix, and it is noteworthy that most of the variables (such as mean wages) do not differ significantly between those who did and did not undertake lifelong learning.

IV. METHODOLOGY

The main methodological challenge is endogeneity bias. The literature suggests that standard OLS estimates of wage returns to qualifications may be biased (Blundell *et al.*, 1999, 2001; Card, 1999). Individuals who undertake lifelong learning are not a random subset of the population. They may be more motivated and able, thus biasing standard OLS estimates upwards. Alternatively, individuals may undertake lifelong learning because of factors that independently depress their earnings. For example, the unemployed may take government-training programmes. Any positive impact of this type of lifelong learning may be outweighed by the negative impact of spells of unemployment.

We use two strategies to address this problem.[6] Firstly, we attempt to adequately control for factors that influence both the likelihood of undertaking lifelong learning *and* also an individual's labour market prospects. Using the rich NCDS data, we condition for a large number of individual characteristics in our model, attempting to control for factors that determine wages, other than lifelong learning itself, that are either observable or well proxied by observable variables. In particular we used attainment scores from tests that were administered at age 11.[7] These test include maths, reading, general verbal and non-verbal ability and scores from a copying-designs test. Altogether, we have five scores. This high dimensionality causes problems when interacting test scores with other variables. Thus we summarise the information into a single index.[8] As well as controlling for early attainment, we also allow for heterogeneity in our modelling by adding interaction terms. Specifically, we allow the wage return to lifelong learning to vary according to the age 11 attainment and the initial 1991 education level of the individual.

The above approach will not solve the endogeneity problem if unobserved characteristics determine both the likelihood of participation in lifelong learning and labour market outcomes. The low explanatory power of our model of the decision to undertake lifelong learning suggests this might be a problem. Our second strategy is to use first difference equations. This utilises the panel nature of the NCDS data, to allow for unobservable but fixed characteristics. Basically the strategy is to estimate the effect of lifelong learning on the change in wages between 1991 and 2000. If an individual is inherently more able and therefore likely to both earn more and undertake lifelong learning,

[5] 30% of males and 36% of females.
[6] Other methods, such as Instrumental Variables, proved impossible with our data. We did however use matching techniques to verify our results. Results available on request.
[7] Most studies using NCDS data have focused on age 7 ability measures. Since it is not our purpose to identify the effect of an hypothetical concept of "innate" ability, we believe the more detailed age 11 scores are more appropriate. In a wage regression, age 7 scores are statistically insignificant when introduced together with age 11 scores.
[8] Using principal components, we derive up to a maximum of five mutually independent indexes that are a linear combination of the original (standardised) scores. The first of these indices explains (by definition) the largest share of the total variation, which in our case reached eighty percent. Wage regressions including all tests support the fact that this first index is substantially more related to wages than all the others. Thus we use only the first index as a valid approximation to an individual's position in the ability distribution. The interpretation of the coefficient on this variable is that it represents the effect of a one-standard deviation increase in the value of the index (with mean zero and unit SD).

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this unobserved ability is assumed to be the same in 1991 and 2000. Under the assumption that the changes in educational attainment (through lifelong learning) are not correlated with changes in unobservable characteristics, we can obtain more reliable information on the effects of lifelong learning on an individual's earnings using this method, although at the cost of larger standard errors.

V. PARTICIPATION IN LIFELONG LEARNING

Table 4 shows the marginal effects of each variable on the probability of acquiring a qualification via lifelong learning (estimated using a probit model). The first column shows the effect of labour market status at the beginning of the period (1991), early attainment or ability (age 11), initial qualification level at age 33, type of secondary school attended, parents' own education and social class, as well as parents' interest in their child's education. In the second column three variables were added describing the labour market position of the individual in 1991, *ie*. their sector of work (public or private sector), size of firm and whether the respondent was a union member.[9]

Men who were unemployed at the beginning of the sample period in 1991, were around 17 percentage points more likely to undertake lifelong learning, than those in work in 1991. This does suggest that lifelong learning is seen as a route back into the labour market, although evidence as to whether it actually does help unemployed males back into work is postponed to the next section. Women who were out of the labour force in 1991 were *less* likely (by 4 percentage points) to undertake lifelong learning over the period. Women may not therefore see lifelong learning as a route back into employment, although again evidence on the effectiveness of lifelong learning in helping women back into work is discussed later.

We control for early attainment at age 11, as described in our methodology section. More able men, and in particular more able women, are more likely to undertake lifelong learning, as was found by Bynner (2001). Initial education level is also an important determinant of the likelihood of acquiring a further qualification as an adult,[10] again especially for women (see also Bynner, 2001). School qualifications have the biggest impact on the decision to undertake lifelong learning, particularly for women. Some post school qualifications also have a positive impact on the likelihood of undertaking lifelong learning for women.[11] Most of the family background variables are insignificant.

The variables describing the labour market position of the individual in 1991 are generally significant. Males who were union members in 1991 were 6 percentage points more likely to acquire a qualification later in life. Male public sector workers were 4 percentage points more likely to undertake lifelong learning. For women, once again union membership in 1991 has a large positive impact (7 percentage points) on the likelihood of undertaking lifelong learning. Sector of work (again as measured in 1991) did not matter for women.

We also investigated the issue of repeat spells of lifelong learning to test whether an individual who undertakes some lifelong learning is more likely to come back for more. Table 5 shows a summary of the results from a probit model where the dependent variable is equal to one if the person is a current learner (on a course leading to a qualification), and zero otherwise. About one in ten of the sample are current learners. Similar controls are used for this model as were used in the previous table but here we only present the impact of prior lifelong learning. The model tests the impact of acquiring a qualification between 1991 and 2000 on the likelihood of being a learner in 2000. The results are consistent for males and females.[12] A person who acquired a qualification between 1991 and 2000 was 10–11 percentage points more likely to be a learner in 2000.

Some caution is required however since these models do not explain a great deal of the variation in individuals' likelihood of undertaking lifelong learning. This suggests that the characteristics that we observe in our data do not fully explain the decision to undertake lifelong learning, suggesting it may not be sufficient to control for these variables in our wage equations to avoid endogeneity bias.

VI. THE EFFECTS OF LIFELONG LEARNING ON LABOUR MARKET OUTCOMES

Standard OLS wage equations

Table 6 gives a summary of results[13] from standard OLS wage regressions, for males and females[14] respectively. The

[9] Ideally of course, we would like to know their labour market position when they decided to undertake lifelong learning but this is not available.
[10] Note however the overall low predictive power of these equations.
[11] Women with degrees or above are less likely to undertake lifelong learning, presumably because they are sufficiently qualified already.
[12] They are also consistent with other studies that adopt different definitions of lifelong learning to the one used here—for example the most recent NIACE survey (Aldridge and Tuckett, 2001).
[13] Full results available on request.
[14] In the context of lifelong learning, there may be domestic factors that simultaneously influence whether a woman works, her wage and whether she undertakes lifelong learning.

Table 4. *Determinants of the decision to undertake lifelong learning*

	Men		Women	
Marginal probability effects	(1)	(2)	(3)	(4)
Labour market status in 1991—base case in full time work				
Part/time1991	−0.050		0.020	
	(0.64)		(1.14)	
Out of Labour Force 1991	−0.101		−0.043	
	(1.91)		(2.29)*	
Unemployment 1991	0.174		0.004	
	(4.43)**		(0.08)	
Ability index–age 11	0.031	0.025	0.049	0.041
	(2.85)**	(1.98)*	(4.29)**	(2.73)**
Highest school qualification—base case none				
CSEs	0.087	0.075	0.134	0.133
	(2.94)**	(2.04)*	(4.06)**	(2.99)**
< 5 O levels	0.083	0.086	0.193	0.188
	(2.98)**	(2.48)*	(6.48)**	(4.76)**
5 + O levels	0.090	0.081	0.185	0.194
	(2.65)**	(1.98)*	(5.19)**	(4.16)**
A levels	0.077	0.075	0.181	0.140
	(2.13)*	(1.73)	(4.66)**	(2.80)**
Post-School highest qualification—base case none				
Lower vocational	0.010	0.029	0.044	0.047
	(0.51)	(1.16)	(2.28)*	(1.87)
Middle vocational	0.027	0.090	0.008	−0.038
	(1.15)	(3.22)**	(0.17)	(0.58)
Higher vocational	0.028	0.042	0.103	0.094
	(1.00)	(1.34)	(3.88)**	(2.85)**
Degree	−0.038	−0.039	−0.070	−0.032
	(1.26)	(1.16)	(2.17)*	(0.76)
Parental education				
Father's years of education	0.007	0.006	0.004	0.006
	(1.24)	(0.86)	(0.64)	(0.78)
Father's years of education—missing	0.097	0.081	−0.006	0.054
	(1.22)	(0.88)	(0.08)	(0.58)
Mother's years of education	−0.002	0.001	−0.003	−0.017
	(0.25)	(0.10)	(0.48)	(2.01)*
Mother's years of education—missing	−0.054	−0.058	0.012	−0.124
	(0.67)	(0.62)	(0.15)	(1.26)
Father's Socio-economic Status—base case unskilled				
Professional	0.032	0.017	0.003	0.041
	(0.60)	(0.27)	(0.05)	(0.59)
Intermediate	0.030	0.026	0.076	0.095
	(0.77)	(0.56)	(1.93)	(1.86)
Skilled non-manual	−0.026	−0.045	0.107	0.142
	(0.62)	(0.92)	(2.43)*	(2.50)*
Skilled manual	0.035	0.016	0.058	0.046
	(0.99)	(0.38)	(1.69)	(1.03)
Semi-skilled non-manual	−0.017	−0.013	0.043	0.020
	(0.21)	(0.14)	(0.49)	(0.18)
Semi-skilled manual	−0.018	−0.053	0.011	−0.010
	(0.45)	(1.12)	(0.27)	(0.20)
Unknown social class	0.054	0.032	−0.035	0.042
	(0.71)	(0.37)	(0.49)	(0.41)
No father/unemployed father	0.020	0.024	0.043	0.017
	(0.71)	(0.69)	(1.49)	(0.47)
Bad financial situation at 16	0.003	−0.000	0.043	0.044
	(0.12)	(0.01)	(2.06)*	(1.61)

(*continued*)

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Table 4. (*continued*)

Marginal probability effects	Men (1)	Men (2)	Women (3)	Women (4)
Type of school attended–base case comprehensive				
Secondary Modern	−0.010	−0.027	−0.012	0.011
	(0.48)	(1.07)	(0.57)	(0.39)
Grammar School	−0.023	−0.025	0.016	0.006
	(0.84)	(0.81)	(0.61)	(0.17)
Public School	−0.036	−0.043	−0.040	−0.060
	(0.99)	(0.99)	(1.07)	(1.22)
Other School	−0.108	−0.122	−0.046	−0.080
	(2.16)*	(1.91)	(0.77)	(0.97)
Parental interest in respondent's education as a child—base case none				
Father: Expects too much	−0.004	−0.072	0.050	0.142
	(0.06)	(0.93)	(0.60)	(1.10)
Father: Very interested	−0.034	−0.056	−0.006	−0.008
	(1.34)	(1.95)	(0.25)	(0.25)
Father: Some interest	−0.006	−0.022	−0.049	−0.069
	(0.31)	(0.91)	(2.32)*	(2.50)*
Mother: expects too much	0.054	0.129	−0.071	−0.093
	(1.08)	(2.14)*	(1.32)	(1.26)
Mother: very interested	0.044	0.075	−0.013	−0.023
	(1.66)	(2.41)*	(0.51)	(0.71)
Mother: some interest	0.034	0.063	0.018	0.034
	(1.59)	(2.42)*	(0.84)	(1.19)
Firm characteristics 1991				
Union member		0.058		0.073
		(3.02)**		(3.23)**
Firm size—base case < 11				
Employees: 11–25		0.020		−0.019
		(0.55)		(0.61)
Employees: 26–99		−0.007		−0.050
		(0.24)		(1.70)
Employees: 100–499		−0.003		−0.031
		(0.09)		(1.01)
Employees: 500 or more		0.048		0.042
		(1.49)		(1.30)
Private sector		−0.040		−0.021
		(2.02)*		(0.98)
Observations	3892	2904	4250	2614
Robust z-statistics in parentheses				

Note: *significant at 5%; ** significant at 1%.

Table 5. *Determinants of being currently on a course leading to a qualification*

Marginal probability effects	Men (1)	Men (2)	Women (3)	Women (4)
Lifelong learning which lead to qualification s5–s6	0.106	0.098	0.112	0.107
	(10.52)**	(8.39)**	(10.28)**	(8.28)**
Observations	3878	2906	4213	3074

Note: Robust z-statistics in parentheses.
*significant at 5%; **significant at 1%.
+All specifications also control for ability, initial qualification levels (in 1991), family background, school type and parental interest variables. Columns 2 and 4 also have controls for union membership, firm size and sector.

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Table 6. *OLS Regression of log hourly 2000 wages on type of lifelong learning*

	Men		Women	
	(1)	(2)	(3)	(4)
Qualification obtained post 1990- base case no lifelong learning qualifications				
Academic level 1	−0.211	−0.282	−0.065	0.059
	(1.65)	(2.52)*	(0.53)	(0.36)
Academic level 2	0.085	0.075	−0.040	−0.017
	(1.23)	(1.03)	(0.89)	(0.31)
Academic level 3	−0.046	−0.112	−0.044	−0.021
	(0.41)	(1.07)	(0.67)	(0.27)
Academic level 4	0.053	−0.046	0.185	0.084
	(1.16)	(0.90)	(6.16)**	(2.66)**
Academic level 5	0.388	0.148	0.531	0.215
	(5.56)**	(1.97)*	(8.87)**	(2.72)**
Vocationally-related level 1	0.131	0.148	−0.010	−0.011
	(0.86)	(1.61)	(0.09)	(0.11)
Vocationally-related level 2	−0.004	−0.022	−0.054	−0.044
	(0.05)	(0.28)	(1.05)	(0.81)
Vocationally-related level 3	−0.058	−0.055	−0.104	−0.100
	(1.05)	(0.98)	(2.07)*	(1.76)
Vocationally-related level 4	0.005	−0.073	0.047	0.045
	(0.09)	(1.20)	(0.83)	(0.78)
Occupational level 1	−0.035	0.011	−0.028	−0.010
	(1.46)	(0.50)	(1.35)	(0.50)
Occupational level 2	−0.171	−0.102	−0.098	−0.067
	(6.16)**	(3.49)**	(3.66)**	(2.48)*
Occupational level 3	−0.033	0.002	0.052	0.083
	(0.71)	(0.04)	(1.31)	(2.00)*
Occupational level 4	−0.053	−0.025	0.226	0.085
	(1.39)	(0.64)	(7.05)**	(2.66)**
Occupational level 5	0.181	0.023	0.273	0.069
	(3.83)**	(0.51)	(5.25)**	(1.21)
Observations	3403	2819	3543	2960
R-squared	0.02	0.25	0.05	0.30

Note: Robust t-statistics in parentheses.
*significant at 5%; **significant at 1%.
+Columns 2 and 4 also control for ability, initial qualification levels (in 1991), family background, school type, parental interest variables, union membership, firm size and sector.

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dependent variable is log wages in 2000, which we attempt to explain by a number of factors, including whether the person has undertaken lifelong learning between age 33 and age 42. The base case is someone who undertakes no lifelong learning during this period. Columns 1 and 3 present the results from a model that only includes a series of lifelong learning dummy variables, for males and females respectively. Columns 2 and 4 add age 11 ability, initial education level and family background controls, as well as union status, firm size and sector variables.[15]

Even without additional controls, the lifelong learning variables are generally insignificant for both males and females, except for higher-level academic and occupational lifelong learning. With full controls, acquiring a higher degree gives males an additional 15% earnings. For women, a degree yields 8% higher earnings and a higher degree yields an additional 22%. Vocationally related qualifications do not pay off for either sex. For women only, level 3 and 4 occupational qualifications (e.g. NVQ3 and NVQ4) pay off, yielding around 8% higher earnings.

With full controls the magnitude of these positive coefficients is always reduced. This implies that more 'able' or advantaged individuals are more likely to undertake lifelong learning (see previous section), biasing the coefficients on the lifelong learning variables upwards. Interestingly males acquiring academic level 1 qualifications (CSE or equivalent) actually earn around 30% less than those who do not acquire any qualifications at all. Also level 2 occupational qualifications (such as NVQ2) yield a negative wage premium for both sexes, even with full controls.

[15] These latter variables have been found to be important determinants of earnings (e.g. Hildreth, 1999; Green *et al.*, 1996; Rees and Shah, 1995; Choudhury, 1994). Public sector workers are more likely to undertake lifelong learning and since public sector pay is lower, we need to allow for sector in our model.

Table 7. *First difference equations*

Change in log wages between 1991 and 2000, 2001 prices	Men		Women	
	Low quals~ (1)	High quals (2)	Low quals (3)	High quals (4)
Academic level 1	−0.557	−0.044	0.228	−0.090
	(1.34)	(0.17)	(0.56)	(0.50)
Academic level 2	0.062	0.109	−0.041	−0.052
	(0.31)	(1.29)	(0.35)	(0.79)
Academic level 3	0.085	−0.037	−0.168	−0.119
	(0.19)	(0.32)	(0.80)	(1.35)
Academic level 4	0.337	−0.049	−0.019	0.012
	(2.49)*	(0.94)	(0.14)	(0.24)
Academic level 5	0.225	0.073		−0.061
	(0.54)	(1.21)		(0.85)
Vocationally-related level 1	−0.054	−0.013	−0.039	0.026
	(1.20)	(0.47)	(0.73)	(0.90)
Vocationally-related level 2	−0.046	−0.083	0.087	−0.035
	(0.79)	(1.98)*	(1.19)	(0.88)
Vocationally-related level 3	−0.017	0.022	0.099	0.057
	(0.17)	(0.37)	(0.84)	(1.01)
Vocationally-related level 4	−0.091	−0.063	0.040	0.043
	(0.85)	(1.18)	(0.34)	(1.05)
Occupational level 1	0.014	0.016	−0.044	0.029
	(0.10)	(0.33)	(0.15)	(0.53)
Occupational level 2		0.374		−0.068
		(1.45)		(0.31)
Occupational level 3	−0.045	0.020	0.004	0.103
	(0.32)	(0.26)	(0.02)	(1.39)
Occupational level 4	−0.094	0.029	−0.163	−0.002
	(0.63)	(0.29)	(0.80)	(0.02)
Occupational level 5	0.065	0.013	0.145	0.178
	(0.38)	(0.17)	(0.64)	(1.92)
Constant	0.086	0.135	0.102	0.112
	(4.97)**	(12.07)**	(4.83)**	(8.68)**
Observations	747	1925	487	1697
R-squared	0.02	0.01	0.01	0.01

Note: Absolute value of t-statistics in parentheses.
*significant at 5%; **significant at 1%.
~Low qualified have no qualifications or just CSEs. High qualified is everyone else.

This might imply that only the least able take these qualifications (and thus earn less) and that we are not able to control completely for this (see next section).[16]

We also investigated whether the effect of lifelong learning varied by initial level of education. Sample sizes meant we could not test the impact of each qualification type and level. We did find weak evidence that those who had no qualifications initially (in 1991), who then undertook any type of certified lifelong learning between 1991 and 2000, earned around 12% more than those who did not.[17] However, this result was not robust to specification changes and the same model also suggested that workers with degrees or above who undertook lifelong learning earned 70% less than those who did not. This seems unlikely. Clearly therefore, there might still be endogeneity bias in these level specifications (see next section).

First difference equations

In our attempt to overcome endogeneity bias, we then estimated first difference equations (Table 7). The only explanatory variables are the lifelong learning variables. This is because only factors that change over the period 1991 to 2000 should be included, such as education level. The model is estimated separately for males and females. To maximise sample size, the sample was divided into two

[16] To check robustness we interacted our ability index with each lifelong learning variable. These variables were insignificant and did not make the negative coefficients discussed above disappear. We also know when the individual acquired their lifelong learning qualification. Controlling for the time since the lifelong learning spell was completed did not alter our findings. Results are available on request.
[17] Results available on request.

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Table 8. *Probit estimates of the probability of leaving non-employment (sample of non-employed in 1991) and the probability of remaining employed (sample of employed in 1991)*

Marginal effects displayed	Leaving non-employment Men	Leaving non-employment Women	Remaining employed Men	Remaining employed Women
Type of lifelong learning qualification obtained–base case no lifelong learning qualification				
Academic	0.067	0.057	−0.011	−0.021
	(0.58)	(0.94)	(0.64)	(0.80)
Vocationally-related	0.003	0.189	0.023	−0.026
	(0.02)	(2.71)**	(1.44)	(0.78)
Occupational	0.220	0.121	−0.007	0.038
	(2.84)**	(3.58)**	(1.03)	(2.77)**
Observations	268	1243	3612	2988

Note: Robust z-statistics in parentheses.
*significant at 5%; **significant at 1%.
+ Specifications also control for ability and 1991 qualification level. The specifications also control for interactions between the ability variable and all the lifelong learning variables. These coefficients are always insignificant.

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groups, low qualified (those with no qualifications or just CSEs) and higher qualified (those with O levels or above). This split is consistent with our results from Table 4, which suggest that those with O-levels or above are significantly more likely to undertake lifelong learning and that this group may be qualitatively different from the less qualified group.[18] The results from the change equations confirm that there are no widespread wage benefits from lifelong learning. However, males who left school with only low-level qualifications do earn substantially more if they undertake a degree via lifelong learning. This group is small but will include more able individuals who are capable of degree level study but who left school with no qualifications or just a few CSEs. We found no positive wage effects for women.

These results seem to confirm that the apparently positive effect from certain lifelong learning qualifications that we found in previous tables may be because individuals with unobserved qualities that make them likely to earn more also are more likely to undertake this higher level lifelong learning. It is of note that even in these first difference equations however, occupational level 2 qualifications (NVQ2 or equivalent) still led to lower earnings for high-qualified males (see previous section).

Employment effects

We modelled both the likelihood of leaving non-employment between 1991 and 2000, and the probability of remaining in employment over the period, according to whether the individual had undertaken some lifelong learning in the intervening period. Table 8 reports a summary of the results.[19] The dependent variable is a dummy variable equal to one if the person is employed (full- or part-time) in 2000. We use a probit model and control for age 11 ability and initial (1991) education level.[20] In the sample 90% are employed in 2000, although the employment rate is higher for men (94%) than for women (86%).

There were just over 1,600 individuals in the NCDS sample who were not in the labour market in 1991, and most of these (over 1,300) were females. Table 8 suggests that for males who were initially not in employment in 1991, those who undertook occupational lifelong learning, were 22 percentage points more likely to be in employment in 2000. Women who were not in work in 1991 and who took either vocationally related or occupational lifelong learning were also more likely to be in employment in 2000 (by 19 and 12 percentage points respectively). Lifelong learning had, by and large, no significant impact on the likelihood of remaining in employment, although women who were employed in 1991, and who undertook occupational lifelong learning, were 4 percentage points more likely to be employed in 2000.

VIII. CONCLUSIONS

We found compelling evidence that learning leads to learning. Not only does acquiring qualifications at school increase the likelihood of undertaking lifelong learning but also undertaking one episode of lifelong learning increases the probability of the individual undertaking more lifelong learning. In general we do not find evidence of positive wage effects from lifelong learning. Some specific types of lifelong learning do appear to boost the wages of the least qualified workers. For example, we

[18] Results are qualitatively similar but sample sizes small when finer educational groupings are used.
[19] Full results available from the authors.
[20] Similar results were obtained when the full range of regressors was included (as per Table 6).

found robust evidence that men who left school with only low-level qualifications, who then acquired degrees via lifelong learning, earned more than their peers who did not do any lifelong learning. There was stronger evidence of employment effects from lifelong learning however. Undertaking lifelong learning is associated with a higher probability of being in the labour market in 2000 for those who were out of the labour market in 1991. This result applies for both men and women. This suggests that although lifelong learning does not lead to measurable increases in hourly wages, nonetheless there are economic benefits, namely employment effects, associated with it.

Our research has also highlighted some important research questions. Firstly, we need to improve our understanding of who is undertaking lifelong learning, and why. We still know very little about the motivation behind undertaking lifelong learning. Only when we have a clearer picture of why people undertake lifelong learning (and who pays for it) can we understand what economic outcomes one might expect from lifelong learning. For instance, one would not expect lifelong learning that is undertaken for non-economic and non-job related reasons to necessarily lead to higher wages. However, there may well be non-economic benefits associated with lifelong learning. Another point that needs to be borne in mind is that our study focuses on qualification-oriented learning and this is a very particular subset of all lifelong learning. Lastly, one possible explanation for our results is that qualifications provide a signal to employers of a person's ability to do the job. Perhaps acquiring qualifications late in life does not send the same signal to employers as acquiring them early on. Although we control for various aspects of a person's ability in our specifications, this is an avenue of research that needs further work.

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